

CLAIMS

1. A hydraulic drive system provided with:

a main hydraulic pump,

a first hydraulic cylinder and second hydraulic cylinder
5 driven by pressure oil delivered from said main hydraulic pump,

a first directional control valve for controlling a flow
of pressure oil to be fed from said main hydraulic pump to said
first hydraulic cylinder,

a second directional control valve for controlling a flow
10 of pressure oil to be fed from said main hydraulic pump to said
second hydraulic cylinder,

a first control device for selectively controlling said
first directional control valve, and

a second control device for selectively controlling said
15 second directional control valve, wherein:

said hydraulic drive system is provided with a pressure
oil feed means for feeding hold-side pressure oil in said first
hydraulic cylinder to an upstream side of said second directional
control valve when a drive-side pressure of said second hydraulic
20 cylinder has increased to a high pressure equal to or higher
than a predetermined pressure.

2. A hydraulic drive system according to claim 1, wherein
said main hydraulic pump comprises a first hydraulic pump capable
of feeding pressure oil to said first hydraulic cylinder and
25 said second hydraulic cylinder and a second hydraulic pump

capable of feeding pressure oil to said first hydraulic cylinder,

said first directional control valve comprises two directional control valves, one being interposed between said first pump and said first hydraulic cylinder, and the other being
5 interposed between said second pump and said first hydraulic cylinder, and

said second directional control valve comprises two directional control valves, one being interposed between said first pump and said second hydraulic cylinder, and the other
10 being interposed between said second pump and said second hydraulic cylinder.

3. A hydraulic drive system provided with:

a main hydraulic pump,

a first hydraulic cylinder and second hydraulic cylinder
15 driven by pressure oil delivered from said main hydraulic pump,

a first directional control valve for controlling a flow of pressure oil to be fed from said main hydraulic pump to said first hydraulic cylinder,

a second directional control valve for controlling a flow
20 of pressure oil to be fed from said main hydraulic pump to said second hydraulic cylinder,

a first control device for selectively controlling said first directional control valve, and

a second control device for selectively controlling said
25 second directional control valve, wherein:

said hydraulic drive system is provided with a pressure oil feed means for feeding hold-side pressure oil in said first hydraulic cylinder to an upstream side of said second directional control valve when said second control device has been controlled
5 over at least a predetermined stroke.

4. A hydraulic drive system according to claim 3, wherein said pressure oil feed means feeds the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve when a delivery pressure of
10 said main hydraulic pump has increased to a high pressure equal to or higher than a predetermined pressure.

5. A hydraulic drive system according to claim 4, wherein said hydraulic drive system is provided with a control stroke detection means for detecting a control stroke of said second
15 control device and a pump delivery pressure detection means for detecting the delivery pressure of said main hydraulic pump, and

a controller for outputting a signal to operate said pressure oil feed means in accordance with the control stroke
20 of said second control device as detected by said control stroke detection means and the delivery pressure of said main hydraulic pump as detected by said pump delivery pressure detection means.

6. A hydraulic drive system according to claim 5, wherein said hydraulic drive system is provided with a mode switch capable
25 of selecting one of a mode, which enables an operation of said

pressure oil feed means, and another mode, which disables an operation of said pressure oil feed means.

7. A hydraulic drive system according to any one of claims 1-6, wherein said hydraulic drive system is provided with a main relief valve for controlling a maximum pressure of said hydraulic pump and an overload relief valve for controlling maximum pressures of said first hydraulic cylinder and second hydraulic cylinder, respectively, said overload relief valve being set at a preset pressure higher than said main relief valve,

said pressure oil feed means is provided with a communication line for guiding the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve, and

a line is arranged to guide pressure oil in said communication line to said main relief valve.

8. A hydraulic drive system according to any one of claims 1-6, wherein said hydraulic drive system is provided with a cancellation means for canceling an operation of said pressure oil feed means to prevent feeding the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve when a control stroke of said first control device has exceeded a predetermined value.

9. A hydraulic drive system according to any one of claims 1-6, wherein said hydraulic drive system is provided with a means for operating said pressure oil feed means when said first control

device has been controlled over a predetermined stroke.

10. A hydraulic drive system according to any one of claims 1-6, wherein the hold-side pressure oil in said first hydraulic cylinder is selectively controlled by said first directional control valve to feed it to said upstream side of said second directional control valve.

11. A hydraulic drive system according to any one of claims 1-6, wherein at least one of said two directional control valves which make up said first directional control valve is provided with a passage to said pressure feed means which feeds the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve and also with a passage which guides said hold-side pressure oil in said first hydraulic cylinder to a reservoir, and

15 said hold-side pressure oil in said first hydraulic cylinder is selectively controlled by said first directional control valve to feed it to said upstream side of said second directional control valve.

12. A hydraulic drive system according to any one of claims 1-6, wherein at least one of said two directional control valves which make up said first directional control valve is provided with a passage to said pressure feed means which feeds the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve and also with a passage which guides said hold-side pressure oil in said

first hydraulic cylinder to a reservoir, and

said passage of said first directional control valve, which feeds the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve, is fully opened from a state that said first control device has been controlled over at most a predetermined stroke.

13. A hydraulic drive system according to any one of claims 1-6, wherein at least one of said two directional control valves which make up said first directional control valve is provided with a passage to said pressure feed means which feeds the hold-side pressure oil in said first hydraulic cylinder to said upstream side of said second directional control valve and also with a passage which guides said hold-side pressure oil in said first hydraulic cylinder to a reservoir, and

said passage of said first directional control valve, which feeds the hold-side pressure oil in said first hydraulic cylinder to said reservoir, begins to open from a state that said first control device has been controlled over at least a predetermined stroke.

14. A hydraulic drive system according to any one of claims 1-6, wherein said first hydraulic cylinder comprises a boom cylinder, and said second hydraulic cylinder comprises an arm cylinder.